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A TREATISE
—ON—
PYORRHŒA ALVEOLARIS.

(RIGGS' DISEASE.)

A SYSTEM FOR ITS

Prompt, Positive and Permanent Cure.

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INSCRIPTION.

This little volume which is intended to convey to my professional co-laborers some of the results of twenty years of observation and study of *pyorrhœa alveolaris*, and assiduous efforts to discover a means of cure, is most affectionately inscribed to my fellows of the National Association of Dental Faculties, with whom I have enjoyed such happy relations since 1887.

JUNIUS E. CRAVENS.

INDIANAPOLIS, IND., June, 1894.

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INTRODUCTION.

In all the history of dentistry the best efforts of the best operators, and the best thoughts of the best thinkers, have been persistently baffled by *Pyorrhœa Alveolaris*—erstwhile known as Riggs' Disease. Occasionally apparent cures have fallen to the lot of all intelligent practitioners who may have aspired to its treatment; but unfortunately isolated cases of recovery failed to reveal a system by which this much dreaded affection might be treated with regularity of procedure and certainty of cure.

The many methods and remedies suggested have served to lead only to hopeless confusion—one might almost say—to despair; so that, for all the years of the marvelous development of dental surgery, *pyorrhœa alveolaris* has been generally conceded to be incurable.

Condemned in advance on the slightest indications of the presence of this disease, thousands of teeth that are entirely free from dental caries are sacrificed to the forceps annually.

In their emergency dentists have appealed to the medical profession for guidance, only to meet with disappointment, while this destroyer has marched on, triumphant over all theories, all appliances, all drugs; a despair to conscientious practitioners and a humiliation to science. The etiology of this disease still is unsatisfactorily explained; its pathology is erroneously written and diagnosis hopelessly ambiguous.

Having been so widely at fault in the premises, how has it

been possible to know how to cure or what constitutes a cure?

The writer is not quite ready to assert positively that a cure of pyorrhœa alveolaris is assertion or reassertion of excementosis; but there are not lacking reasonable proofs favoring such a phenomenon.

Whilst attending the World's Dental Congress at Chicago, 1893, it was the good fortune of the author to make the acquaintance of Dr. George B. Clement, of Macon, Miss., who is a skillful microscopist, and had prepared a number of microscope slides mounting specimens of cementum cut from tracts that had been involved in pyorrhœa "pockets." Dr. Clement holds that "the lesion within the socket is a disease or result of a disease of the cementum;" that it induces an obstruction of the lacunæ and canaliculi by deposition of lime salts therein (obstructive calcification); that by this process the external structure of cementum becomes solidified, so that the physiological relation with pericementum is suspended, thus leaving the cementum practically dead. Starting from these premises Dr. Clement's conclusion is that there must be a reassertion of cementum *over the obstructed tract* in order to restore lost vital relations to cementum before a cure of pyorrhœa alveolaris is possible. Believing that to thus induce an excementosis is impossible, Dr. Clement holds pyorrhœa alveolaris to be incurable.

The author is ready to confess that if the conclusions of Dr. Clement are correct the prospects of relieving the particular suffering of poor unfortunate men and women would be unpromising indeed. The specimens exhibited at Chicago by

Dr. Clement certainly demonstrated clearly enough that the lacunæ and canaliculi do become obstructed—even to obliteration—in the peripheral lamina when long bathed in pus in “pockets” of this lesion.

It is well understood that the functional relation of pericementum to cementum is dependent upon canaliculi, consequently the complete obstruction of these little canals shuts off vital connection with pericementum and renders that membrane a useless covering to the solidified tract; under these conditions the membrane recedes toward the line of attachment. It certainly is doubtful that where once receded the pericementum may be reasserted entirely.

It belongs to the future to disclose whether the conditions reported by Dr. Clement, and amply illustrated, are to be accepted as constant facts or only accidental to a number of cases. Very much is dependent upon this proposition.

In August, 1892, at Niagara Falls, N. Y., the writer reported a case in practice before the American Dental Association, by kindly permission of Dr. T. W. Brophy, Chairman of the Section on Oral Surgery and Pathology. In that report were given in detail the method and remedies resorted to successfully in a case of some nineteen “pockets,” the result being a complete and surprisingly rapid cure of all.

The permanency of cures in this case was not only a matter of grave doubt to some, but others actually disputed that there had been any cure whatever. The writer had the fortunate opportunity to carefully examine this case thirteen months after the reading of the report, and of all the nineteen “pockets”

treated there was not one in which there was any evidence of recurrence of the disease. A letter received within two months from this patient (who resides in a distant State), gives assurance that there still is no reappearance of pyorrhœa alveolaris after more than twenty months. That there has been a cure, and a permanent cure in this case, would appear assured.

This system was also given in detail by the writer at the recent Dental Congress at Chicago (1893). Section IV. (See reports in Dental Cosmos).

As early as the summer of 1891 the writer was enabled to cure a number of cases, which are still free of the disease, but was not successful in establishing a definite system by which uniformly good results were attainable until in July, 1892, the experiments culminated in the case reported at Niagara Falls in August of that year; from that time to this date the same system has been pursued with a long succession of cases—many being desperately bad—with no failures whatever reported. Nearly every case treated has been under surveillance and subjected to monthly inspections.

SOME PROPOSITIONS.

It may be stated as a general proposition, that wherever a tooth retains good attachment upon one or more sides of its root, it may safely be classed as curable, without regard to looseness or the condition of the pulp.

The conservation of pulps in pyorrhœa alveolaris is dependent entirely upon the demands or convenience of the case in hand, according to the judgment of the operator in charge.

Inferior incisors that are loose and wobbling about in their funnel-shaped sockets, without attachment other than semi-ligamentous at the apices, have usually gotten beyond this specific lesion (into the exfoliative condition), and are hopeless. Pyorrhoea may be stopped in these cases, but substantial attachment cannot be induced.

When, after treatment, there is no longer accumulation of pus, no congestion of the gum, and a notable shrinkage of gum immediately over or adjacent to the "pocket," the case may be considered fairly cured—certainly not before.

Whilst it devolves upon a practitioner to maintain cleanliness of a mouth containing teeth that are under treatment, or that have been, and a continuance of sanitary care of all "pockets" treated—for several weeks after—he cannot justly be held responsible for constitutional failure of the patient and consequent inability to recuperate or reproduce bony support for the roots that have become denuded in the progress of this disease.

Eradication of the disease is the end of the dentist's function in any case, after which he can do no more than to co-operate with an intelligent physician in guiding as to habits, diet, etc.

JUNIUS E. CRAVENS.

CHAPTER I.

PYORRHŒA ALVEOLARIS.

(Phagedenic Pericementitis; Riggs' Disease. Calcic Inflammation)

Whatever may be the apparent present cause of a given case of phorrhœa alveolaris, it must be admitted that the formation of calcarious matter in crusts about the necks of teeth is conducive to establishment of that disease.

Whatever tributary effects are to be anticipated from progressive organic disease as in affections of the kidneys, bladder or lungs must be left largely to the future of individual cases to determine; that such influences are operative in a measure, is manifested often by extraordinary tendency to calcarious deposition upon the teeth of certain subjects, or by an observable inconstancy of the gum about the necks of some or all teeth. Either of these manifestations would indicate organic disturbance extending far back of any local conditions, and depending upon constitutional obliquity that may be hereditary or acquired—and in the latter case may be temporary.

For the purposes of this work I have classed salivary calculus under two heads—*visible* and *invisible*.

VISIBLE CALCULUS—TARTAR.

The first class consists of accumulations of salts of lime that constantly are precipitated from saliva in the mouth, together with particles of oral and extraneous matters that become involved in the mass which is commonly observed and called

“tartar.” Tartar forms hard crusts, adhering to teeth and in contact with the gum. It is well known that the gum recedes from contact with tartar, such recession affording space for further accumulation and addition to the mass that thus rapidly grows—sometimes to enormous proportions.

This process of deposition, recession and redeposition when occurring upon a root, may continue until the affected side is denuded of gum and process almost to the apex. It is also true that such a root usually remains securely attached upon all other aspects, often continuing firm, or fairly so, in its impaired socket, revealing no “pocket” and exhibiting no *pus*.

A WORD ABOUT GINGIVITIS.

The very common condition called gingivitis, consisting of inflamed, swollen and readily bleeding gums, is scarcely to be dignified as a disease, although it often is mistaken for pyorrhœa alveolaris, and is treated accordingly. Gingivitis readily responds favorably to simple treatment, which need consist merely in removal of deposits of tartar from about the cervix, to be followed by local applications of stimulative and astringent character.

While experience has shown that in some instances salivary calculus may prevail in large masses on teeth, without serious consequences, unfortunately it appears that there often are evil influences from visible tartar that extend beyond the mere fact of gingival irritation, and contributing to the establishment of a definite pathological condition of the periosteum or pericementum—or both, in varying degrees. Owing, how-

ever, to the obscurity of the parts involved, to the hemorrhage attending operations, and to the extreme sensibility of imposed tissues it is difficult, if not impossible, to determine the degree in which the pericementum or periosteum may be affected.

ETIOLOGY.

In certain cases inconstancy of gum forming the gingivæ is general, a condition suggesting heredity, but sometimes—probably the more frequent—is only a diathesis that has been induced by general debility, thus inviting pyorrhœa alveolaris, the debility itself passing away on opportunity for recuperation of the individual; the obliteration of a diathesis, however, will not carry away with it pyorrhœa alveolaris once established.

Beyond the gum tissue the invading calculus encroaches upon the periosteum that envelops the bony process forming the orbit of the alveolus or socket; the immediate effect of this encroachment is to establish periostitis at that point. The congestion of the periosteum may extend slightly within the socket, where, because of the extremely limited space between the cementum of the root and the wall of the socket the periostitis is aggravated, increased vascularity demands more space, which is afforded only by resorption or removal of the involved section of alveolus wall.

POCKETING.

After the enlargement of a portion of the socket in the manner suggested, the pericementum—for a time at least—loosely adheres to the cementum; the periosteum, although

badly congested, maintains relations with the bony wall; the space between the membranes thus separated becomes occupied by saliva entering in from the oral cavity, carrying with it in solution and otherwise, various extraneous substances. Other elements emanating from the membranes involved in the sockets are projected directly into the space made by the inflammatory action and resorption referred to; these accumulated elements become stagnated and putrefaction and pus follow in rapid order. Thus is formed what is called a "pocket," containing pus, and the establishment of definite pathological conditions to which is given the name *pyorrhœa alveolaris*.

PATHOLOGY.

The pathology of *pyorrhœa alveolaris* has never been satisfactorily written; indeed it is difficult to set forth; but from facts appearing in its etiology and observations of the progress of this lesion, it evidently is a culmination of an inflammation affecting the periosteum first about the socket and later within it; sympathetically the pericementum is affected, not congested, but in a form or degree of hyper-nutrition through which calcic infiltration eventuates in the structure of the cementum itself. The final effect of such calcic infiltration is solidification and peripheral obliteration of the little lakes and canals of the corticle structure of the root (obstructive calcification).

It is possible that the pericementum may also become acutely but temporarily inflamed because of conditions of environment, but if so it evidently occurs in the incipient stage of the disease, because, when teeth that are "pocketed" are ex-

tracted a congestion of tracts involved in the pus cavities is rarely observed.

The progress of the disease is indicated by a deepening of the "pockets," to which the further encroachment or even the continued presence of calculus of any character is not essential. On the other hand, incrustations may serve to perpetuate the chronic character of the disease without inducing acute manifestations or apparent progress.

INVISIBLE CALCULUS.

At a remote, or at best an obscure point upon the affected side of a root, in a deep "pocket," the observant operator discovers an incrustation that is essentially different from that which has been called visible or plain salivary calculus. The hidden calculus usually is discoverable to the sense of touch through a delicate instrument. Efforts to remove the crust prove it to be more adherent than ordinary visible tartar; that the mass is smaller, or often is spread thinly out over the surface of the root; that it is found separate from the visible variety, from which it differs materially in appearance.

Probably there is no point in connection with a consideration of the entire subject of pyorrhœa alveolaris, upon which there exists a greater diversity of opinions than as to the character and origin of the calculus found so tenaciously adhering to roots in the pus "pockets." This particular deposit has been variously ascribed as salivary, sanguinary and serumal—the latter two terms being employed synonymously by many.

The terms sanguinary and serumal are applied to the calculus in those cases where there appears to be no opening for in-

gress of saliva to the place of the calculus; these are called *blind* "pockets" as a distinction from the open ones; the distinction, of course, is carried inside the socket itself, and so we have the claim set up that the calculus found there is not only of a very different character, but has a different origin from that of salivary calculus, or that found in open "pockets."

As a precise fact I doubt the existence of any really blind cases, but hold that for every one there is a means of ingress from the mouth as well as a necessary means for drainage into the mouth. The dental surgeon may not be able to discover an opening to a "pocket" with such appliances as usually are at hand, but it is there nevertheless and it *ought to be discovered*.

From observation of cases in practice I know that a fairly open "pocket" may occasionally be closed by orbicular contraction, rendering ingress difficult, and doubtless such cases have been passed upon as *blind*. This is a passing condition, the opening again becoming free or fair. An exception to this, and rarely observed, is where a fistulous opening through the gum affords drainage, much as in cases of ordinary alveolar abscess; I have had but one such case, in which an incision was made to reach the calculus.

Professing to entertain the highest regard for opinions expressed by the distinguished writers upon this subject, and disclaiming any aspiration to appear to differ from others, it is my privilege, perhaps my duty, to take exceptions to certain conclusions, particularly where their expressions have appeared

ambiguous as to the immediate derivation and character of the calculus found in these pus cavities.

The calculus of pyorrhœa alveolaris, whether in open or blind "pockets," possesses a composite character that at least has escaped a proper emphasis hitherto; it contains all the elements of visible or salivary calculus, although the extraneous elements that usually are involved in oral tartar are here in modified proportion, in a ratio corresponding to difficulties of ingress; also, this hidden calculus possesses characteristics and elements that cannot be accounted for orally, being almost wholly of an organic derivation, a circumstance that contributes to support of the sanguinary or serumal hypothesis.

It is my belief that the source of these peculiar elements of the deeper "pocket" calculus is to be found in the pus itself; that it should be called pyonal calculus. The mass is thus composed of a combination of pyonal calculus and ordinary salivary calculus.

The pus analysis from an average specimen, by Payne, in Quain's Dictionary of Medicine, shows that in 1,000 parts there are alkaline salts—other than sodium chloride—3.2, and of earthy phosphates and iron, 2.1. This gives a total of 5.3 in 1,000.

Prof. Dalton's analysis of human saliva, parotid, as given in Litch's American System of Dentistry, reports in 1,000 parts that calcium phosphate is in 0.240; in a specimen from the submaxillary glands there were of 1,000 parts, calcium carbonate, calcium phosphate and magnesium phosphate, combined

1.16. In the same volume, the analysis of human saliva by Bidder and Schmidt, in 1,000 parts, shows one item of 0.98 composed of sodium, calcium and magnesium phosphates.

From the preceding analyses, it is evident that the proportion of lime salts in pus is far in excess of that in saliva at any point of production, singly or mixed.

With these facts in view, it should be rather a matter of surprise that the deposition of calculus within these "pockets" continues so small.

MECHANICAL CONSIDERATIONS.

In response to a proper instrument—properly applied—the invisible calculus may be brought away, but always in small particles; never in liberal masses like ordinary salivary calculus.

Should the root be affected upon a side that is flattened or grooved, the crustation will extend along the flat or in the groove, and in some cases approaches the apex; but if the surface be convex, the calculus frequently may be found crossing horizontally, feeling to the operator like a ligature of small, hard cord or wire; this latter form is always near the cervix, and easily removed.

The absolute and complete removal of the concealed incrustation should be the operator's first and chief solicitude, as failure in any part of this procedure insures failure to effect a cure.

Sometimes, but fortunately not always or often, this con-

cealed tartar is of a coffee-brown color, when it is particularly tenacious and unaccommodating, and its removal is accomplished with great labor, persistence and patience.

Often after the first sitting for removal of hidden calculus, on return of the patient, the shrinkage of gum is so great as to expose a number of brownish particles adhering to the root, which the operator readily removes.

PROGRESS OF PYORRHŒA ALVEOLARIS.

As a result of continued periostitis, the wall of the socket is gradually destroyed along the axis with attendant deepening of the "pocket," affording space for greater accumulation of pus and rubbish. In time, the periostitis tends to spread laterally, all the while occasioning removal of more and more of the alveolus wall, until finally the loss or unstableness of support results in looseness of the root, a condition that seriously compromises prospects for recovery of usefulness of the tooth, but does not prevent eradication of the disease in that socket.

Instances are frequently noted where the resorbing process, due to continued periostitis has completely girdled roots that were held in place by a sort of ligament of hypertrophied pericementum, permitting motion in all directions within the funnel-shaped socket. In such cases (most frequently of inferior incisors), the disease has literally run itself out, and the wide-open socket is merely a receptacle for refuse matter that may chance to get into it. These are hopeless cases.

THE PERICEMENTUM.

Just how the perieementum may be affected in pyorrhœa alveolaris is not definitely known. Certainly it cannot maintain a state of unimpaired health in a continuous bath of pus. In profound "pockets" of long standing the pericementum disappears, commencing at the cervix and extending toward the apex; later, in some instances, it appears to have been reasserted at or near to the cervix, which probably is due to accidental or other removal of the incrustation at that point. One fact bearing upon this point should be noted, that the enduring calculus will not attach to the pericementum directly, but encroaching upon that membrane causes it to recede, and the calculus is thus enabled to fix itself directly upon the cementum. By this process the pericementum becomes permanently thickened and corrugated near the apex, definitely marking the chronic stage. This corrugated membrane is not dead because it is sensitive, besides if dead it would slough away; it can not be induced to reattach itself to the cementum it has abandoned, consequently before a cure may be hoped for the whole or a portion of the detached membrane must be brought away, to the end that a new and active and healthy membrane may be asserted.

To Dr. George B. Clement, of Macon, Miss. (to whom reference is made in the introductory chapter of this little volume), doubtless belongs the credit of having discovered the cause for the apparent loosening and disappearance of perieementum in "pockets" of long standing pyorrhœa cases, and the apparent futility of attempting to induce a resumption of

its proper physiological relations with cementum that it once has abandoned, unless there be first induced a return of the cementum itself to normal conditions—at least as to the periphera.

Dr. Clement has demonstrated that in at least some cases the canaliculi and lacunæ of cementum involved in these pus “pockets” become filled by obstructive calcification, necessarily confined to the outer laminae, thus effectually shutting off vital connection with the imposed pericementum, which disappears or possibly in some cases remains a useless covering to the solidified tract—a discarded mistress.

Taking into consideration the conditions described, and accepting them as facts, it is possibly true that, as Dr. Clement concludes, there can be *no cure for such cases except by assertion of at least one stratum by excementosis* over the solidified tract; this may be realized only under the activity of a new pericementum; hence the necessity for surgical removal of the loosened, hypertrophied and torpid pericementum, as well as the solidified superficial cementum in “pockets” of chronic pyorrhœa alveolaris.

CHAPTER II.

CHARACTERISTICS.

Pyorrhœa alveolaris may appear upon any aspect of a root, but most frequently affects the approximal faces.

While a pus "pocket" exists upon the labial face—for example—of an inferior incisor root, each approximal face may also present a "pocket," as well as the lingual face, and each of these "pockets" be entirely separate from the others.

In some instances two "pockets" upon the same root will be found connected by a *gallery*; this connecting gallery may remain concealed from the operator's observation, and cause him much embarrassment in treatment.

AS TO GALLERIES.

Galleries are not common to all pus "pockets"—for which one may be thankful, but are more frequently present than may be supposed. I am satisfied that *galleries* are directly responsible for many failures where operators have been skillful and painstaking in treatment. They are to be found in at least two varieties—*simple* and *blind*. *Simple galleries* connect two "pockets," while *blind galleries*, having but one opening, are confined to a single "pocket." The *simple galleries* are the more easily discovered, because water forced into one of the two connected "pockets" will pass *through the gallery* and appear at the opening of the other "pocket." *Blind galleries* must be discovered by careful probing.

GROTTOES.

The attention of readers is called to a differentiation from the galleries, one that enhances complications and is very difficult of management by the operator, even should he be fortunate enough to discover its existence; this, also, is much oftener present than may be suspected—I refer to excavations between the roots of molars and two-rooted bicuspid. I have a number of times found a “pocket” extending up the approximal face of a root of a superior molar, and passing in between the roots, having excavated the bony process to such an extent that the inner faces of the roots were exposed for a third of their length. These grottoes are also simple and blind; the blind passing into the crotch, and terminating there; the simple passing entirely through, possibly beginning and ending in “pockets.”

The inferior molars are also subject to the grottoing process.

Pyorrhœa alveolaris is often symmetrical, but quite as often is not, therefore one may infer that it is not always inherited, nor even constitutional. It does not necessarily prevail *en sequence*, and is not contagious—even from socket to socket in the same jaw.

A tooth that is in proper relations with other teeth in the arch may develop chronic pyorrhœa alveolaris upon any aspect, and so continue the sole case of pyorrhœa in that mouth for years.

Given an entire phalanx of inferior incisors, each member of which presents an approximal “pocket” on each side, a selection of alternate teeth may be made from such phalanx,

treated and completely cured, the other members remaining uncured—untouched—the cured teeth will remain free from the disease indefinitely.

After a cure has been effected in any cases, and the “pockets” closed, there is no notable tendency to a recurrence of the disease.

Although an untreated “pocket” always contains pus, the latter may not be exhibited by pressure, because in some deeper cases the external plate of process remains intact, and, although much thinned by resorptive or erosive action, still remains strong enough to resist and hold against ordinary finger pressure; therefore the symptom of oozing or expressible pus is not always observed. In such cases the pus is revealed by probing.

THE BONY SEPTÆ.

The destruction of alveolar process, due to periostitis, in pyorrhœa alveolaris—is peculiar to the bony septæ in which often the loss is very extensive.

The festoons of gum immediately overlying the “pockets” are always quite spongy, and the first reliable indication of recovery of health to the part is a marked contraction of the spongy gum; this contraction is incident to forming eschar, and must bring the gum well to the bone, and the extent of shrinkage therefore will be in proportion to the amount of bone that has been lost. Often this shrinkage of gum is so extensive as to alarm the patient and annoy the operator, but as it is essential to reliable indication of cure it should be

hailed with pleasure by both. The contraction between the teeth usually results in forming a dimple, which marks the triumph over pyorrhœa alveolaris.

SYMPTOMS.

The symptoms of pyorrhœa alveolaris are divisible into *constant* and *inconstant*.

CONSTANT SYMPTOMS.

Pus is always present in untreated "pockets."

The gum tissue overlying a "pocket," is puffed and glazed, the color being a modification of violet.

In interdental spaces the gum appears to take a secondary growth, sending a wedge-shaped process toward the articular line; this process usually is of an angry red color. This condition of gum generally indicates the earlier stage of the disease. Incidental shrinkage occurs later, after which the violet color becomes more apparent.

In all cases, the "health line" dips to the orifice of the socket. In proportion as a state of health obtains, the "health line" is reasserted.

In chronic cases where there are a number of "pockets," the patients report feverish discomfort in parts involved at all times; a disagreeable taste emanating about the teeth—particularly after protracted sleep; frequent lassitude; impaired digestion.

INCONSTANT SYMPTOMS.

Pus expressible from "pockets" with a finger or other means.

Frequent lancinating pains in affected sockets, and sometimes regional neuralgia that may involve an entire side of the jaw.

Slow but progressive recession of gum at the cervix, attended by excessive sensibility of exposed surfaces.

Distressing night-pains when in bed, sometimes described by the sufferer as a *drawing sensation* in the "pockets"—relief from which is obtained by sitting up in any manner to avoid sleeping in a recumbent position. This symptom is peculiar to cases of long standing, and indicates extremely deep "pockets."

Loosening of teeth in their sockets, at times elongating or lifting, and soreness.

Rotation of one or more teeth, sometimes pushing them out of the arch—a condition more common to incisors, but occasionally affecting bicuspid.

In very bad cases where there are many "pockets" of unusual pyorrhœal activity, the faces of patients may appear puffed, particularly under the eyes, skin appearing doughy; extreme languor; bad gastric condition.

DIAGNOSIS.

By inquiry ascertain the observations of the patient, and note to what extent they may comport with the symptoms stated herein.

Observe any gingival inflammation and sponginess of gum, and bluish or violet color about the necks of teeth.

Apply firm pressure with a finger or other means upon the gum at cervical regions and watch for possible expressure of pus.

Test all gingival borders with a delicate, flat, non-rigid probe, in quest of "pockets."

Interrogate the patient as to gastric disturbances—due to ingested pus.

If the complexion is sallow, and the face puffed, particularly under the eyes, inquire for urinary disturbances.

TREATMENT.

First remove from the mouth all visible salivary calculus.

Having located a "pocket" and determined the form and depth, the operator should, if possible, definitely locate the calculus, and inform himself as to its extent, etc. These points are essential to a proper selection of instruments most available for the proposed operation.

In conducting the preliminary examination it should be borne in mind that the pus "pockets" are of two kinds, *simple* and *complex*. A complex "pocket" is *galleried* or *grottoed*, while simple ones have direct continuous sides that are easily followed by a probe. Complex "pockets" seriously complicate procedure, even when fully understood.

For the purpose of examining the "pockets" the writer has found most practicable a steel sound, not exceeding half a line in width, the angles all carefully reduced, the end rounded and smooth; the handle should be octagon and slender, the

blade flat and long and slightly curved. The advantage of this instrument is the facility with which it may be inserted into narrowest or smallest pus "pockets" with safety to all parts; it does not needlessly distend the entrance, and may be easily passed to all parts of nearly all cases.

CULTIVATED TOUCH.

As very much depends upon the sense of touch in operating in these cases, clumsy instruments are inadmissible, and it is essential that the cushions of the thumb and fingers of the operating hand shall be soft and sensitive to a high degree. This condition may be attained by submitting the hands to a bath of fairly hot water immediately preceeding an operation, and it may be renewed once or twice during an operation should the fingers feel glassy.

HOT WATER.

For the purposes of the surgical operation, have at hand a supply of water heated to 140° Fahrenheit, and an ordinary three-ringed syringe; charge the syringe with the hot water and proceed to wash out the "pocket" selected for an operation, projecting as forcible a current as may be developed with thumb and fingers.

In every instance this process of hot douching should be repeated four or five times in rapid succession, as it not only assures the thorough cleansing of the "pocket" by removal of pus and extraneous substances, but the stimulating effect of the hot water is essential.

Hot water excites both pericementum and periosteum to a

high state of receptiveness, permitting quick effect of a solution of cocaine, which should be applied immediately within the "pocket" to induce local anæsthesia. If properly applied this solution will obtund even the cementum in most cases.

There is no danger of using the hot water too freely if the temperature is carefully maintained at 140° Fahrenheit.

The ordinary nozzles that come with the three-ringed dental syringes are too large for the treatment of pyorrhœa alveolaris, as they frequently cannot be inserted into the "pockets" without force, which is not admissible. Accordingly the operator should supply his case with a number of syringe-nozzles of various sizes from the hypodermic to the ordinary, with a variety of curves for convenience of direction. The hypodermic nozzles should be ground stubbed at the end, instead of pointed.

The operator should bear in mind that 150° Fahrenheit scalds, but that as high a temperature as may be safely used is best; in order that accuracy may be had there should be at hand a common dairy thermometer, costing about 25 cents, and the fact that 140° Fahrenheit is about as high a temperature as safety to soft tissues would warrant, should be remembered.

LOCAL ANÆSTHESIA.

It is absolutely essential that the surgical operation shall be attended with little or no pain (far better none), otherwise it often will be impossible to induce a patient to submit to completion of a sitting; even where, possibly, the endurance of a patient has been equal to the suffering inflicted during a first

sitting without anæsthesia of any character, he leaves the office of the dentist with a mental reservation that he will not return for another sitting. It is far better to avoid this dread than to have to labor to overcome it.

By a proper application of local anæsthesia this operation may be rendered so free from pain that patients may be depended upon to return cheerfully for any number of sittings that may be deemed necessary.

Often the dentist finds it necessary, or at least desirable, to operate upon several teeth at a single sitting, requiring protracted effort on the part of the operator, and subjecting the patient to a test of endurance that without due safeguards might result in nervous collapse, or in something akin to surgical shock. In such protracted operations the patient should be fortified and protected by an effective local anæsthetic or obtunder of some character.

GENERAL ANÆSTHESIA.

General anæsthesia is not practicable in operations in pyorrhœa "pockets." It adds seriously to the difficulties of the surgeon, who has enough to occupy his whole attention without having the care of an insensible and unaccommodating subject of anæsthesia; it also contributes the element of danger to annoy the operator under circumstances where all should be perfectly safe; besides, it requires special assistance, which sometimes is objectionable to patients, and might necessitate the presence of a physician.

COCAINE.

A saturated solution of cocaine in water may be used effectively for obtunding sensibility in gum or other soft tissues, which sometimes is advantageous in preliminary manipulations, but seldom can be made effective to reduce sensibility in the pericementum or cementum. But cocaine may be made effective for these tissues, even to the apices of roots, without hypodermic administration or danger of any ill effects, and so thoroughly obtund all parts involved that an operation of considerable magnitude may be carried to completion without notable discomfort to the patient.

The preparation of cocaine that in my hands has produced the very best results, and with greater uniformity, upon the pericementum and even upon the cementum itself, is a solution of the alkaloid in Squibb's chloroform; it is a saturation, but attains a strength of only about 8 per cent. It is prepared as follows:

Put half an ounce of the chloroform in a suitable bottle, add freshly pulverized hydrochlorate of cocaine, shaking and waiting a few seconds after each addition of the alkaloid, until the solution clears. To this solution add six to eight drops each of oils of cloves, cassia and menthol, and to this add ten drops of Mary Stewart extract or some other of equal strength of flavor. The idea is to perfume the solution and render it agreeable.

Although a saturation of cocaine in chloroform cannot exceed a strength of 8 per cent., yet the addition of the essential oils and flavoring extract increases the solvent property

of the mixture, and it will take up enough more cocaine to make fully 10 per cent., which it should be given. After the completion of the solution it should be of a clear amber color and a beautiful preparation, with a very agreeable odor.

This solution of cocaine is absolutely stable for any length of time, and because of the addition of the essential oils there is scarcely any perceptible evaporation of the chloroform during use from the bottle. Aside from their therapeutical values the essential oils, by their combined odors, help to disguise the odor of chloroform, which is so familiar to many and always alarming to some, to others intensely disagreeable.

All water solutions of cocaine are extremely unstable, and are expensive unless prepared in very small quantity at a time as needed.

TO APPLY COCAINE.

Referring again to the forcible douching of pyorrhœa "pockets" with water at 140° Fahrenheit, the last injection of hot water should be immediately followed by the cocaine solution, which should be introduced directly into the deepest part of the "pocket" in barely sufficient quantity to flood the pus cavity without overflow; for this purpose one drop will be enough in almost any case. After each introduction of cocaine the case should be protected against saliva for two or three minutes, after which expectoration may be permitted quickly. The douching with hot water and following with the cocaine solution should be performed alternately three or four times before proceeding with the operation, the object being to induce a cumulative effect of the obtunding drug.

Pre-application of hot water hightens and quickens the effect of the cocaine solution, apparently stimulating the tissues and promoting receptiveness in them. Immediately after the third or fourth application of cocaine, as herein described, the surgical operation should be commenced, and usually it should be painless altogether.

In very deep "pockets" it often is necessary to inject the cocaine solution in order to bring it in contact with all parts, but care must be exercised that the injection is made into the "pocket" only.

It is not possible to protect an injected case from encroachment of saliva always, but in excessive flow of saliva the dentist will have to repeat the cocaining process two or three times extra in order to be fully successful. If patience and perseverance are exercised there will be splendid results from the application of cocaine, as here given.

For most cases the most convenient, effective and economical device, for applying any of the preparations used in this treatment, is a common goose-quill shaped like a slender tooth-pick and scraped thin to secure flexibility, leaving the long feather stem for a convenient handle. A quill is practically unaffected by medicinal agents used in dental practice. This indestructible property is particularly valuable in the secondary treatment, where some of the remedies used are highly corrosive. But this will be fully explained in its proper place.

CHAPTER III.

SURGICAL PROCEDURE.

Having selected a suitable instrument for a particular case, it should be passed gently along the surface of the root, within the pus "pocket" to the point of attachment of membranes, wherever that may be. Press the hooked blade of the instrument firmly against the root, beyond the incrustation, and with steady retractive efforts remove all obstructions from the surface of the root, and if possible reduce all roughness; this may require expenditure of considerable time and exhaustive persistence. After removal of all discoverable calculus, the surface of the root itself should be well and thoroughly scraped, no effort being made to conserve pericementum.

If during a protracted operation, there should promise a return of sensibility to the part, prompt resort should be had to hot water, to be followed with the cocaine solution, after which the operation may be proceeded with in assured insensibility to pain.

There is no possible danger of the scraping of the root being overdone; removal of thickened pericementum within the "pocket" and the scraping away of subjacent cementum which has become partially or wholly solidified by obstructive calcification, or saturated with pus, will conduce to reassertion of a healthy pericementum and assured superficial excementosis, i. e., *certain cure*.

To the experienced and skillful operator success should attend the first operation in nearly every case; whenever this initial success is not realized, the operator may rest assured that either some particles of attached calculus remain, or that the cementum itself requires further scraping, or possibly that both deficiencies exist.

The surgical operation must be repeated as often as necessary to attain completeness.

As before suggested, the dentist may rely on the beneficent power of cocaine to carry his patient through the most protracted operation incident to treatment of pyorrhœa alveolaris.

DILUTE SULFURIC ACID.

Water solutions of sulfuric acid are stable. Before entering upon the surgical work described, the dentist should have at hand a solution of one part commercial sulfuric acid in ten parts of pure water; or, if he desires to be exact, a five per cent. solution of C. P. sulfuric acid in distilled water.

The surgical operation should be followed, within a few minutes, with an application of the dilute sulfuric acid, directly within the treated "pocket." As sulfuric acid is a severe irritant to raw surfaces, it is better to obviate pain by continuing the use of the cocaine solution once in the same manner, as at first. This will so obtund sensibility in the parts, that the acid will occasion no discomfort whatever to the patient.

For applying the diluted sulfuric acid in this treatment, there probably is nothing better than a syringe, as the prepa-

ration should be forced to all the parts of the "pocket," no account being taken of overflow, except reasonable precaution should be taken as to quantity used. In some deep cases, the quill device should follow the syringe, to insure the diffusion of the acid to all parts of the "pocket."

The application of sulfuric acid completes the surgical sitting; after this application, the parts should be guarded for a moment against encroaching saliva, until the surface of blood-clot at the entrance to the socket becomes well glazed. This clot blackens under the influence of the sulfuric acid, and for a time acts as a hermetical dressing, preventing the ingress of extraneous matter—possibly even of saliva.

After completion of the first sitting, the patient should be required to return in five days, when possible, for secondary treatment.

OPERATIVE NOTES.

The chloroform solution of cocaine is a subtle fluid, and in spite of one's best efforts will escape to some extent and flow about the mouth; under such circumstance, there may be produced some sensations to the patient that are unpleasant, possibly alarming; this effect, however, is merely local, and is readily dissipated by laving the mucous surface well with some form of diluted alcohol. The matter of use of alcohol should be rather a choice, according to the taste or prejudice of the patient—a simple inquiry will settle that point.

Alcohol may be diluted by adding one tablespoonful, to a half-glass of water; or the same amount of ordinary druggists' bay rum (perfumed alcohol, 50 per cent.), in a fourth

of a glass of water ; or, as is preferable in most cases, a table-spoonful of whisky may be held in the mouth for a couple of minutes ; the effect gives almost instant relief, and the patient leaves the office of the dentist with no unpleasant impressions, which should always be the case in order to insure a return for necessary subsequent sittings. I would suggest that the *bay rum* should not be swallowed, as the dentist can not well know the medicinal properties of the elements of perfumery it may contain.

INSTRUCTIONS TO PATIENTS.

Patients should be cautioned to carefully avoid the use of alkalies in the mouth, as far as possible in diet, and particularly in dentifrices or mouth-washes. During treatment, and for some months subsequently, common pulverized sulfur should be used as the sole dentifrice ; it polishes the teeth much better than chalk, and exercises a mildly antiseptic influence ; the extremely small per cent. of free sulfuric acid that always is present in commercial sulfur aids in acidulation of saliva. Sulfur thus used is a great aid to the recuperative period. Sometimes there is an aversion to sulfur on the part of patients, which usually is based on early reminiscences of the ills of childhood ; a little reasoning and good advice may overcome such objections to the extent of a promise of regular use of the stuff for a specified number of weeks.

All cases are much benefited by the frequent use of a solution of alum in clean rainwater, the brush may advantageously be wet with it when brushing with the sulfur powder. The taste, however, is not of an agreeable character to most persons.

SECONDARY TREATMENT.

At the beginning of a second sitting, the dentist should carefully press with a finger all about the orifice of the "pocket" recently operated upon, to ascertain whether any pus may be still expressible, or, slightly open the "pocket" with the flat probe to liberate confined pus—if any there be (?). Also, he should look for evidences of shrinkage of gum between the teeth, and at any other part in which there had originally been noticed the bluish or violet coloring. The shrinkage occurs oftenest and most markedly in the festoons between the teeth, where it usually forms little dimples—sometimes deepening into distinct funnel-shaped pits in the soft tissue. The latter form always indicating extensive resorption of the septum.

The shrinkage of the gum is assurance of cure; although in some instances the shrinking of gum will be so extensive as to alarm the patient, particularly if on or toward the labial aspect of an anterior tooth, it should be borne in mind and impressed upon the patient that *there can be no cure without shrinkage of gum in proportion to the loss of alveolar process immediately subjacent.*

If the examination at the second sitting shows that the surgical work was effective and shrinkage satisfactory, the "pocket" should again be douched liberally and forcibly as in the first instance, the water at the specific temperature of 140° Fahrenheit, in order to assure thorough cleansing of the pus cavity. If the operator desires to use peroxid of hydrogen, or the three per cent. solution of pyrozone, he may do so

to better advantage or at least to greater satisfaction after the douching with hot water, as the foaming makes a much prettier display where everything has been thoroughly cleansed previously; the fact is that it is not an indicator of pus, and that the greater the proportion of pus present the less foaming activity of the pyrozone.

After the thorough washing out of the "pocket" at the beginning of the secondary treatment, the next step is to treat the case with a ten per cent. solution of nitrate of silver, which should be made to permeate every possible part of the pus cavity.

NOTES ON NITRATE OF SILVER.

Nitrate of silver should be applied with a quill device (previously described) wherever practicable. It is true that the solution can be better applied with a syringe, but it is highly destructive to the metal of which syringes are made; it fouls rubber syringes in a most peculiar manner and renders them useless very soon. It is expensive to have syringes constantly damaged and maybe ruined by medicinal agents, but the dentist who essays to succeed with this method of treating pyorrhœa alveolaris must not expect to do so too economically. If, in a given case, it appears necessary to inject this solution of nitrate of silver into a "pocket" in order to attain success, there should be no hesitation at the cost of an ordinary dental syringe.

After applying the nitrate of silver solution, it is well that the case be protected against saliva for a minute or two.

Due precautions should be taken to protect any metallic fillings or devices from the blackening corrosive action of nitrate of silver.

Observe that the ten per cent. solution of nitrate of silver is just short of the caustic strength.

The solution of nitrate of silver is very unstable, as are all solutions of this salt in water. As it is expensive it is best that the solution be made frequently if necessary, and in small quantities.

If the dentist prefers or finds it necessary to prepare his own solution of nitrate of silver, he can easily do so by weighing out six grains of the crystals and dissolving them in one dram of filtered or distilled water.

Observe the solution of nitrate of silver daily, and as soon as flocks of black solid matter appear it is deteriorating, and should be emptied out. The solution keeps better in blue glass bottles, and must be kept tightly corked against organic particles afloat in the air.

Glass stoppers are not best in bottles containing solutions of nitrate of silver; common corks are far better.

It will do no harm in any case to repeat the nitrate of silver treatment at a third sitting, although one usually suffices.

After all use of nitrate of silver shall have been completed, the patient's teeth and fillings should be carefully polished free from all stains.

SUBSEQUENT CARE.

In most cases, after the second treatment, the patient may report in a week with no evidences of the disease in the "pock-

ets" that have just been treated; but the "pockets" will be there until nature can fill them in with new bony structure, which requires time. The case, meanwhile, must be kept clean by weekly or fortnightly attention, washing out the "pockets" with the hot water in forcible currents, and treating them with injections of some acid astringent; preference may advantageously be given to strong solutions of chloride of aluminum, or, better still, the standard preparation known as *bromo-chloralum*—which is sold by nearly all druggists.

The chloride of aluminum (common alum) or the bromo-chloralum should not be used at the same sitting with nitrate of silver, owing to the facility with which a chloride of silver may be formed by such combination in the mouth. This chloride of silver has a light or whitish color, and clings to a tooth-root more tenaciously than even the calculus, and positively will not scale off, but must be scraped to the last bit.

If possibly there are evidences of pus in a treated "pocket" at the third sitting, the dentist may rest assured that the surgical operation must be repeated, and extra care taken to make it complete and final, if possible. Instead of such an unfortunate coincidence being discouraging, it should stimulate to better effort and a determination to conquer success.

The operator will be gratified and fortified by having his patient to return once or twice a month for a couple of months, as these occasions for examination will afford assurance of absolute successful cure, and to warn the patient as to uncleanness about the teeth.

SOME PROPERTIES.

Delicate napkins should never be used in this treatment, as the principal medicinal agents employed are highly damaging to fabrics; pieces of ordinary muslin will be found effective and economical.

Before beginning treatment at any sitting, the patient's face and lips should be annointed with some oleaginous matter to protect from irritation and discoloration; for this purpose nothing appears simpler or better than a perfumed preparation of vaseline, which may be ever at hand.

An assortment of long, slender scalers have proven most effective in the hands of the writer. They have been devised and selected so as to form a set, arranged in pairs—straight, curved, simple and compound; some essentially peculiar—all in rights and lefts. All act on the hoe principle—both to and from the operator. This set is the result of developing emergencies under the treatment pursued by the writer, who has had arrangements made for their manufacture by a reliable firm*, and they may be ordered through any reputable dealers in dental supplies.

Always have at hand a large apron of rubber or oiled silk, with which to protect the clothing of the patient from water or damaging agents of any sort.

The dentist should keep a systematic and concise record of his cases of pyorrhœa alveolaris, beginning with the initial examination; otherwise a number of cases on hand at the same time, and in various stages of treatment, would lead to hopeless confusion.

*H. D. Justi & Son, Philadelphia.

In closing this chapter the writer urges upon the operator to exercise perseverance, devote greatest possible pains to discovery and removal of every particle of calculus from the root, all loose and thickened pericementum, and thorough scraping of the cementum involved; lastly, he must possess inexhaustible patience and sympathy.

Absolute success must attend every case, and this is possible; no partial success can be awarded any credit whatever—that has been the stopping place for a hundred years. Partial success is only modified failure, in treating pyorrhœa alveolaris.

CHAPTER IV.

TARTAR.

Salivary calculus or tartar is universal in the mouths of mankind, and probably in some degree common to all species that are provided with saliva.

All authors upon this topic agree that salivary calculus is principally composed of certain salts of lime precipitated from saliva in the mouth, with various other accidental ingredients that become involved in resultant crust. It is rather difficult to discover very much that is instructive written upon the etiology of salivary calculus, but much of an ambiguous character. It seems to the writer that the tartar so commonly observed in mouths of our patients, is so ordinary and commonplace as to have attracted little important consideration.

That this salivary deposit has not only an interesting etiology, but also important physiological properties there is abundant reason for believing; also, the preceding chapters on *pyorrhæa alveolaris* certainly justify conclusions as to pathological considerations.

Dr. George Watt, of Xenia, Ohio, wrote in his little volume of Chemical Essays, as follows: "The lime salts named are probably present in all normal saliva—in solution. * * * Water is the chief constituent of saliva, and sub-phosphate and carbonate of lime are but slightly, if at all, soluble in water. But normal saliva is saturated with free carbonic acid, and

thus charged is able to dissolve and hold these lime salts.

* * * If by any process this carbonic acid is taken from the saliva, it cannot hold the salts and they are precipitated as tartar. * * *

The alkali that nearly, if not quite, always takes this carbonic acid from saliva, is ammonia.

* * * The ammonia may be a result of the putrefaction of nitrogenous matter within the mouth."

The statement of Dr. Watt that the ammonia may result from putrefactive change in nitrogenous matter within the mouth, means that the decomposition of meats and particles of other articles of food left between the teeth, results in liberation of enough ammonia to cause precipitation of the salts of lime from saliva, resulting in calcarious accumulations and crustation around and upon the teeth.

There are some medical works that shed valuable light upon the subject of salivary tartar, rather indirectly certainly, but presenting facts of pathological nature that are applicable here. In Vol. I, of the "Reference Hand-Book of the Medical Sciences," 1885, may be found the following language: "With regard to the immediate nature of the process involved in the precipitation of the lime salts, there is some difference of opinion. The simplest mode of explanation, and one which at present may be considered as nearly correct as any we have, is to look upon the process as similar to that involved in the formation of stalactites."

All of us have noted the occasional incrustation that occurs on stones, and sometimes even on sticks and logs in streams and pools of water, the crustation varying according to the

term of immersion and the geological character of the territory in which the water was confined or through which it had passed. Water-pipes in our houses, and water-mains under cities become encumbered in time with incrustations of the lime salts that have been in solution in the water.

Every one, probably, has recollections of a home in which as a child he enjoyed special privileges, among which was visits to the kitchen, where he was interested in watching the old tea-kettle whose lid danced apparently for his amusement as the steam sputtered out just as it did for the other Watt in the other century. One can recall the curious incrustations of lime that lined the tea-kettle's sides and bottom—much to the annoyance of the cook of early and blessed memory. The lime that encrusts the stone in the brook, that lined the old tea-kettle, that obstructs the water pipes, is *tartar*; not exactly salivary calculus, but tartar nevertheless, without the additional elements of epithelium scales and general trash of internal and extraneous origin.

Continuing quotations from the "Hand-Book of the Medical Sciences," we have the following: "A certain amount of calcareous matter is a normal constituent of the blood in which it is held in solution by the carbonic acid always present in sufficient quantity to keep in solution twice the normal amount of earthy matter." Herein we have full corroboration of the statement made by Dr. George Watt upon the same point.

In the "Hand-Book of the Medical Sciences" from which quotations are made, we read further: "When the circulation is impeded, the free carbonic acid (because of its great diffus-

ibility) is readily absorbed by the tissues or goes to form new compounds, necessitating a precipitation of the calcarious matter. * * * Calcarious matter may be deposited in either a fibrous or fluid matrix."

There can be no doubt that material environments may exert a great influence on the character, quantity and rapidity of accumulations of tartar upon the teeth of individual subjects.

There are mechanical conditions that conduce to the formation of scales of tartar upon the teeth. Practitioners daily observe mouths wherein for some reason, perhaps a habit, or owing to a deformity, or to a weakness of the jaw or muscles of mastication, due to disease or accident, there has been a failure to employ a large portion of the teeth in mastication. In such instances experience teaches us to anticipate extensive deposits of calcarious matter upon the unused teeth. But we do not always find it so; the fact remains, and unexplained, that some individuals are blessed with immunity from deposits of dental tartar, notwithstanding that they are utterly negligent of the sanitary condition of their mouths, which perhaps may be accounted for by their thoroughly employing their teeth in mastication of food; all of which is in evident accordance with creative economy, and therefore correct.

It would be interesting to know certainly, to what extent and in what way the state of health of the individual may or does modify the tendency to deposition of lime upon the teeth. The healthiest appearing subjects often present the most annoying predisposition to such deposits, while it is a fact well known among dentists that consumptives are but little an-

noyed with accumulation of tartar upon their teeth ; but if the lime salts are deposited in certain other parts, tissue or organ, such as the bladder or lungs, the blessing of immunity from salivary calculus may be a doubtful one at best.

Physiologists tell us that the phosphate and carbonate of lime are to be found in all the tissues of the body ; that they are in solution in the water of the body by virtue of carbonic acid. Quotations given in this chapter show that there is enough carbonic acid in the blood alone to enable it to hold double the necessary quantity of these salts ; that there is nearly always an excess of lime salts in the water of saturation and circulation ; therefore, that the saliva should be surcharged with these salts is a normal and healthful state, and should be anticipated and appreciated.

That certain effects are produced in the alimentary canal by the salts of lime after they are precipitated in the mouth and swallowed with food, the following would appear to indicate ; "In ordinary food there is more of the phosphates than the system has need of, so that they are constantly escaping with the stools." [See Wood and Bache's U. S. Dispensatory, 1876.]

There is abundant evidence to show that the salts of lime really temper the feces in the intestine, the phosphate acting as a mild laxative and the carbonate checking tendency to diarrhea or too free discharges.

After all then, the precipitation of lime salts from saliva in the mouth is evidently physiological and therefore desirable. Probably the only unnatural and pernicious aspect of such

salts in the mouth consists in their accumulation on the teeth, which simply *is permitted*. The rational course is to not attempt interference with natural processes, but strive to induce our patients to exercise reasonable cleanliness and to prevent accumulation of tartar on their teeth by employing those organs in a manner at least approaching what Nature intended in endowing them with teeth.



